*American Law & Economics Association Annual Meetings*

*Year* 2004 *Paper* 45

# Heuristics and Biases Among Experts

Jeffrey Rachlinski
Cornell Law School

Chris Guthrie
Vanderbilt law School

# Heuristics and Biases Among Experts

Jeffrey J. Rachlinski*
Chris Guthrie**
(Preliminary Draft)

Abstract

*Repeat players in transactions have many advantages over novices. They have more resources and they have more information. Many aspects of the legal system, from civil discovery to mandatory disclosure, are designed to level the playing field between novices and experts, both to avoid exploitation and to facilitate efficient transactions. These efforts assume that the central advantage repeat players have is in better information. We propose, however, that experts also possess better cognitive skills that enable them to process information in a more unbiased fashion than novices. To test this, we presented materials designed to test for the influence of several cognitive processes that are known to mislead novices to insurance claims adjusters and reinsurance executives. The participants in our study are thus consummate repeat players. We found that indeed, the insurers resisted the misleading influence of these cognitive process. At the same time, the insurers did express some tendencies towards mistaken judgment. In the main, however, the pattern of results we obtained were differed markedly from the patterns observed in lay persons. The results thus support the conclusion that experienced actors develop superior cognitive abilities to manage complex information.*

## I. Introduction

In any transaction, information is power. Contracting parties, litigants, and even consumers who engage in exchanges with parties who have more information risk entering into unfavorable exchanges. Awareness that a lack of information makes one vulnerable also impedes negotiated solutions. The market for lemons (Akerlof) , the winner's curse (Thaler), and the negotiator's dilemma (Lax & Sebenius, 1986) all consist of negotiation traps that arise from a lack of information on one side of a transaction. Thus, the advantages of having greater knowledge than a negotiating partner is well-recognized and acknowledged in public policy debates. Less well-recognized is the potential for differential cognitive processing of available information by experienced and inexperienced parties. Experience might allow parties to develop ways to avoid errors in judgment that might be common among the naive. Experienced actors might thus use cognitive advantages to no less effect than informational advantages.

* Professor of Law, Cornell Law School.

** Professor of Law, Vanderbilt Law School.

*HEURISTICS AND BIASES AMONG EXPERT NEGOTIATORS*

The prospects for cognitive exploitation arise from the basic nature of human judgment and choice. To manage complex information, people develop simple shortcuts, or heuristics. (Tversky & Kahneman, 1973). These heuristics are generally useful, and lead to accurate judgment much of the time. (Gigerenzer et al). They can, however, lead to mistakes in judgment. Because people develop mental shortcuts to address particular choices and judgments they must make, when they apply these heuristics in novel settings, they can make mistakes in judgment.

For example, people commonly rely on a heuristic known as "representativeness" to determine whether an exemplar is a member of a broader category. To the extent the exemplar resembles, or is similar to, the broader category, people judge the exemplar as more likely to be a member of that category. In other words, if a bird walks like a duck and quacks like a duck, it is likely to be a duck. This heuristic is obviously useful, but it might lead people to ignore certain features of the problem that they do not commonly encounter. Wholesale reliance on the representativeness heuristic might lead people to ignore statistical considerations such as the relative proportion of ducks versus geese in a population from which the bird was drawn. Often, such statistics are consistent with the underlying inference. Ducks tend to flock together, so rarely does one encounter one duck in a group of one hundred geese. The rare clue that the bird was drawn from a large population of geese, thus might get neglected. Most demonstrations of people's reliance on heuristics rely on manipulation of background cues in ways that might be uncommon in the real world, so as to isolate and highlight reliance on the heuristic. (Tversky & Kahneman, 1996).[1]

Experience with a particular type of judgment leads to several cognitive advantages. First, when experience is accompanied by accurate, meaningful feedback, people can learn that the thought processes on which they have relied in making a judgment can lead to errors They might thus begin to abandon the simple heuristic that led them astray in favor of a different approach. The same situation can be described in many different ways, some of which will lead to more accurate judgment. (Rachlinski, 2003, for a review). Numerous examples of the benefits of cognitive restructuring can be found in the psychological literature. For example, oftentimes people will express overconfidence in their knowledge when asked to express their degree of confidence in a subjective probability format (e.g., "how likely is it that you answered this question correctly?"), but will not express the same overconfidence when asked the same question in a frequentist format

[1] This fact is often mistakenly identified as a weakness of the cognitive research on judgment and choice. (Arlen, 1998; Gigerenzer, 1991; Hillman, 2000; Rosina, 2000). That the laboratory settings can be misleading is precisely the point. Human judgment is generally good precisely because we tend to rely on heuristics in a natural setting for which they were developed. (Gigerenzer, 2000; Cosmides & Tooby). Judgment in unusual or unnatural contexts, however, certainly occurs in the real world as well, and it is precisely in these setting in which heuristics developed for one purpose can mislead by being put to an application in which they mislead.

(e.g., "if you were asked ten questions of similar difficulty, how many would you get correct?"). (Gigerenzer, 1991). Similarly, even as professionals commonly understates the time necessary to complete a complex task, they often recognize that they never complete such tasks within the short time frames that they believe they can achieve. (Kahneman & Lovallo, 1995). Experience can teach people to abandon misleading representational structures in favor of ones that might highlight the proper solution.

The difference between verbally described mathematics problems and identical numeric equations illustrates the point well. Anyone who recalls the process in grade school of converting mathematical word problems into equations is familiar with this process. At first, mathematical word problems can be challenging, in part, because the notion that verbal problems can be converted into equations is unfamiliar to second-grade children. Such problems generally cannot be solved while they remain in their verbal representational structures, and first need conversion. Most students quickly convert experience with the process of converting verbal problems into equations into a facile ability to solve these problems. If the conversion process itself were meaningless and effortless, then there would be little to be gained from experience with the problems. As with many complex judgments, however, people simply need experience manipulating verbal mathematics problems into a format more amenable for resolution.

The second advantage experience confers is that experience teaches people to develop new heuristics that are specific to the new situation. Although much of the writing about heuristics describes them as a collection of widely used mechanisms to solve common problems (e.g., representativeness, availability, anchoring), people also learn heuristics that are highly task specific. Consider expert chess players. Expert chess players are far better than beginners at recognizing complex patterns among chess pieces. Indeed, it is not the case that experts consider more possible moves and evaluate them quickly, their expertise allows them to consider fewer possible moves than a novice. (Cite, from PS paper). Expert chess players asked to memorize a board also do not scan the full board for individual pieces, they fixate on the midpoints between those pieces that have meaningful relationships. (PS, 1999). Experts develop new, task-specific heuristics that give them fast, efficient, and accurate ways of processing complex information.

Experts thus do not merely possess better information than novices, they possess more accurate ways of evaluating and using relevant information. Consequently, merely providing information to inexperienced actors is only a limited way of leveling the playing field between experienced and inexperienced actors. Nevertheless, from the discovery process in civil litigation to informed disclosure requirements in many types of contracts (mortgages, sales of automobiles), the legal system relies on information disclosure as the primary means of both avoiding the holdup problems and potential for exploitation that information asymmetries create. The difference in cognitive abilities to process this information can undermine disclosure as an effective remedy.

Worse yet, disclosure might lead the novice to rely mistakenly on disclosure as an effective protection against exploitation. Once information is disclosed, the novice might come to believe that

the experienced party has lost its advantage. The novice might recognize that her understanding of the costs and benefits of the transaction could be erroneous, but might believe this misunderstanding to be no more or less erroneous than the experienced party. The experienced party might be larger and able to take advantage of risk-aversion among inexperienced, smaller parties, [2] but with equal information the transaction seems otherwise as likely to be advantageous to the novice as to the experienced party. The problem is that the inexperienced party might be systematically processing the information inaccurately in a way that allows the experienced party to dupe the novice into disadvantageous agreements.

Consider the "market for lemons" problem as one example. (Akerlof). In a standard form, the problem runs something like this: suppose A is considering selling some asset to B that B knows is worth between $0 and $100 to A, but will be worth 50% more to B. Efficiency would thus be enhanced if the transaction were to occur, inasmuch as B values the asset more than A. But if B knows, nothing else, then the transaction will not occur. This is because for any amount B offers A for the asset, A will only accept if it is worth less than the offer. The expected value to B for any completed transaction will thus be 50% times one-half of the offer, or 75% of the offer.[3] Knowing this, B will refrain from making an offer. If A were required to disclose all of the pertinent information concerning the asset, then B would be able to estimate the expected value of the asset more accurately, and hence make an offer that A would accept (although, perhaps just barely). Thus, information disclosure would seem to ameliorate the problem, and facilitate the transaction.[4]

---

[2] There is a large literature on this, and it is obviously not entirely clear that such an arrangement is exploitation. Insurance, for example, can be mutually beneficial to the larger, more experienced insurance company than the novice individual, who needs to protect her limited assets from uncertainty.

[3] Suppose, for example, B offers to buy the asset for $50. A will accept only if it is worth less than $50 to A. The expected value of the asset to A, conditional upon a sale, is thus $25. Because B values it 50% more, then B will have purchased an asset with the expected value of $37.50, for en expected loss of $12.50. The same result obtains for any offer B might make greater than $0. Hence, B is better off making no offer, even though efficiency would be gained if the transaction occurred.

[4] Holding aside the problem that information is costly to acquire and requiring A to disclose all of its information gives B an opportunity to obtain the entire bargaining window, thereby undermining A's incentives to create information.

Now add cognitive impediments to the problem. But suppose that B evaluated the information in a way that caused B to overstate the value of the asset by 50%.[5] Unaware of its bias, B will consistently offer slightly more than the commodity is actually worth to B, which B will perceive to be necessary to get A to accept. A will always accept, happily realizing slightly more than a 50% gain from the transaction. B will be initially pleased, thinking it has extracted all of the potential gains from trade, but will eventually realize that A had the better of the bargain. Furthermore, A will have every incentive to disclose the information in a format that would induce B to overvalue the asset. If A is a repeat player in this market, then A will have amply opportunity to experiment with different formats, and find the one that will induce novices to overestimate the asset's value. Unlike the standard version of the problem, B, as a novice, will fail to recognize the risks of transacting. Cognitive errors are notoriously difficult to spot in oneself, and overconfidence in one's ability to evaluate information is common. Thus, a differential in cognitive skills can solve the impediments to a trade, but can facilitate the exploitation of naive parties.

Numerous examples of the limits of information disclosure exist. (Hanson & Kysar, 1999). For example, even though "rent-to-own" companies disclose the terms of their rental agreements to the prospective renter, they manage to exploit the cognitive vulnerabilities of their customers. (Cites). Calling the terms of their arrangements "rentals" allows these companies to charge many times the real interest rate that they would be able to obtain from consumers than were they to call their arrangements "loans." Few consumers would willingly pay double the cost of a couch or television set if it were offered in a loan format, but people commonly enter into such transactions when they are offered in a rental format. The information under which the agreement is offered is clearly available, but takes advantage of the way consumers process information. Similarly, car-rental companies consistently manage to convince well-insured customers that they need further insurance to cover "deductibles" on their primary insurance. (Cite). Consumers who sensibly undertake insurance agreements with high deductibles nevertheless make a different choice at the rental-car counter. In one of the clearest applications of cognitive "anchoring" credit-card companies induce customers to transfer money to their accounts based on unimaginably low initial rates, that then expand dramatically after a few months. (Cites). Brokerage houses also seem to manage to induce small investors to deviate form sensible, "buy-and-hold" strategies with seemingly low-cost trading fees and slick ads featuring ordinary people who have accumulated vast wealth by savvy activity in the stock market. (Cites to review of e-trade ads). In every case, the information upon which to act sensibly is easily available to consumers, but they nevertheless fail to do so. The most striking example may be cigarette manufacturers; for decades, their products have carried clear messages about the dangers of the tobacco, even as their advertising manages to convince consumers to embrace beliefs that facilitate cigarette consumption. (Hanson & Kysar II, 1999).

[5] In many cases, this would lead B to come to believe the asset is worth more than $100, which would be inconsistent with its initial beliefs.

Occasionally, lawmakers are savvy enough to identify the source of the cognitive error and require information disclosure be presented in a fashion that will facilitate sensible choice. For example, food labels are notoriously misleading, but large markets must include a price per standardized unit (such as ounce or pound) to facilitate comparison shopping. (Russo). Similarly, even though consumer lending presents enormous opportunities for deception (e..g., reporting interest rate in daily units), credit cards, mortgages, and car loans must report their interest rates in standardized terms. (Cite). Mortgages and car loans in particular, must be reported in multiple ways (annual interest, plus monthly payment), to facilitate sensible consumer choice. These mechanisms recognize the limits of disclosure alone to facilitate good judgment when a novice negotiates against a repeat players.

Critical to the concerns about inexperienced decision makers is the notion that experienced decision makers will perform better than novices. If the experienced decision makers suffer from the same kinds of cognitive errors as novices, then the concern for exploitation is misplaced. Society wants to protect borrowers from lenders because we believe that lenders evaluate the terms of the loans properly and borrowers suffer from errors that facilitate their exploitation. If lenders make similar errors in evaluating their loan decisions, then they lack any real ability to exploit consumers. Indeed, they are just as likely to be exploited by consumers.

As noted above, the opportunities for experienced parties to make better use of information is clear. Lenders, for example, are far more likely to do the math and calculate the costs and benefits of making a loan, rather than just making choices on instincts, as consumers might. Repeat players have the motive and opportunity to think differently about a problem. They need not even be aware of exactly what cognitive biases plague inexperienced parties in order to take advantage of them. (Hanson and Kysar, 1999). All that experienced parties need to exploit novices is to be able to experiment with different ways of assessing a problem and different ways of presenting the same information. In fact, in a competitive environment, repeat players that fail to find the right way of assessing problems and exploiting consumers might be weeded out.

But how good are experienced parties, really? Many have expressed the intuition that experienced, repeat players avoid simple cognitive errors, (Cites) but few empirical tests exist to support that intuition. In this study, we report the results of research on a group of consummate repeat players--employees in the insurance business. Insurers are classic repeat players. In offering policies, they repeatedly engage in the same transaction with parties who might only infrequently think about the terms under which they purchase insurance. The basic pricing mechanisms for insurance also require thinking about risk in the most rational terms. Systematic cognitive errors in evaluating risk that plague most people would mean bankruptcy for insurers.

Our results suggest that indeed, insurers resist many common cognitive illusions of judgment found to affect lay people. Our result suggest that insurers are less sensitive to a decision's frame (gain or loss), and express fairly good intuition about statistical reasoning. At the same time, we uncovered several vulnerabilities among insurance employees, all of which seem to arise out of their

expertise. The strengths we found are the kinds of strengths that would allow insurers to take advantage of novice judgment. At the same time, their weaknesses are ones that would be hard for an ordinary consumers to exploit systematically. This pattern allows insurers to exploit consumers, and yet renders insurers surprisingly vulnerable to risks associated with under-pricing hazards.

## II. The Studies

### A. Methods and Materials

#### 1. Participants

We recruited a total of 189 employees in the insurance industry to participate in our study. These consisted of three different groups. The first consisted of 44 insurance claims adjusters participant attending a conference entitled "Claim Handling: Innovations for the 21st Century", held in Stamford, Connecticut in November of 2000. The conference was sponsored by General ColognRE, a reinsurance company, for their clients (who consist of primary insurance companies). The second study involved 86 attendees at the annual conference of the Reinsurance Association of America held in Philadelphia in May of 2001. The attendees consisted of officers from major reinsurance companies from the United States and Europe. Among the participants were the chief executive officers and the chief operating officers from several major reinsurance companies. The third consisted of 40 insurance claims adjusters and 19 lawyers working in the insurance industry attending a conference on dispute resolution sponsored by the University of Missouri-Columbia, held in Kansas City, Missouri, in November of 2002.

#### 2. Methods

In all three groups of participants, the methods were similar. At the conferences, we distributed questionnaires to the participants in person. We asked participants to read and respond to each of several questions and to do so quietly and independently. Participants essentially did this while sitting quietly in a large room at the beginning of our session of the educational conference (or in one case, at the evening before while sitting at dinner tables). We did not ask the participants to identify themselves and so all responses were anonymous. The first page provided the title of the conference included the following instructions:

> Many of the points discussed by at the following presentation are best understood if experienced directly. We therefore ask that you read and respond to each of the questions enclosed in this survey (although doing so is voluntary, of course). Please do so independently and **please do not discuss the surveys with others while you are responding to the questions**. We shall collect these surveys before the discussion and present the results during the upcoming session on psychology and settlement

In all cases, the participants were informed that participation in the survey was entirely voluntary. The final page of all versions of the questionnaires gave the participants the opportunity to limit the use of their answers to the educational workshop by circling a paragraph explaining that they had this option. The paragraph noted that if the participant circled the paragraph, we would excluding their results from discussion in context other than at the educational conference and would exclude them from use in any publication. None of the participants circled the paragraph.

3. Materials

The stimulus materials themselves tested for the influence of several cognitive illusions of judgment previous identified in laypersons. Specifically, we included items to test for the influence of framing effects, representativeness and other misleading intuitions about statistical inferences, anchoring, self-serving inference processes, the egocentric bias, and contrast effects. The phenomena reported in this paper are described in the sections below. Each of the two insurance groups evaluated five items, and the reinsurance group evaluated 8 items (although two of the items were only presented to half of the participants each). Specifically, the first insurance group evaluated items involving: framing effects, statistical inferences (two items), anchoring, and the egocentric bias. The second insurance group evaluated items concerning: framing effects (two items), statistical inferences, anchoring, and the self-serving bias. The reinsurance group evaluated items concerning: framing effects (2 items), statistical inferences (three items), contrast effects, anchoring, and the egocentric bias.

We exclude several of the items in this paper. The item concerning contrast effects proved to be confusing and misleading, and we do not report on it further here. For simplicity, we do not report the results of the self-serving inference and egocentric biases here.[6] This leaves three phenomena: framing effects, representativeness, and anchoring. All three have the potential to have sizeable influences on the pricing of risk, which is the central feature of the insurance business.

B. Framing Effects

People process options that involve a gain from the status quo differently from those that involve a loss from the status quo. (Tversky & Kahneman, 1979). People appear to react more strongly to the potential for losses than to the potential for gains, which psychologists call loss aversion. (Korobkin, 2003, for a review). The character of a decision as involving gains and losses also influences people's willingness to undertake risk. (Guthrie, 2003, for a review). When confronting gains, people are risk-averse, preferring sure options to riskier ones with equivalent expected value. By contrast, when confronting losses, people are risk-seeking, preferring risky options over sure ones with equivalent expected value. For example, most people state a preference for a certain $100 over a 50% chance of winning $2000, but prefer undertaking a 50% chance of losing $200 to a certain $100 loss. (Tversky & Kahneman, 1992, Advances in PT paper).

[6] The materials on the self-serving bias, run in only one group, are hard to compare to the results on laypersons. We found that claims adjusters committed the self-serving bias, in that they evaluated materials in a way that favored their perspective. The effect appears to be much smaller than what one observes in lay persons, but the comparison is imperfect. As to the materials on the egocentric bias, we found that the vast majority of insurance employees, like most employees, rate themselves as better than average at their job.

This pattern of preferences is inconsistent with rational choice theory. Rationally, most people should express some degree of risk aversion, so long as they are trying to maximize utility, rather than wealth. But rational choice theory predicts that people evaluate the effect of risky options on their total wealth, rather than on departures from the status quo. Data from many different groups of people in many different contexts, however, suggests that departure from the status quo is an important factor in individuals' decision making. (Camerer, 2002; Guthrie, 2003).

For insurance companies in particular, employing the pattern of risk preferences that framing creates would be destructive. Risk-aversion would be troublesome, inasmuch as the reflexive, psychological risk-aversion of the kind described in the literature on framing would cause insurance companies to overprice their willingness to undertake risk. Even if many insurance companies did employ such a bias, this would create an opportunity for an unbiased (or less biased) firm to enter the market and capture business. A risk-seeking perspective is no less troublesome. Firms that adopt a risk-seeking perspective will underprice their policies and, in the long run (perhaps not even too long) will fail to accumulate sufficient revenue to cover their losses and face bankruptcy. Insurance companies essential business requires attending to the amount of risk they undertake relative to their assets. With respect to framing, insurance companies must mimic the rational actor model and not the subjects that cognitive psychologists observe in their research.

To test whether insurance-industry employees manage to avoid the influence of framing, we used three different scenarios involving suit and settlement and one scenario involving a risk management question concerning potential litigation. We chose litigation for two reasons: framing and litigation is well-studied, and litigation should present the best chance for insurance employees to avoid the influence of framing. First, for most people litigation presents a natural frame. (Rachlinski, 1996). Most lawsuits consist of a plaintiff attempting to secure the assets from a stakeholder-defendant. In evaluating litigation strategies, particularly settlement, the plaintiff chooses among gains, while the defendant chooses among losses. If rational choice theory predicts their behavior well, the role of stakeholder or non stakeholder should not matter, but if framing effects influence litigants, then plaintiffs should make risk-averse choices, and defendants should make risk-seeking choices. (But note observations by Guthrie, 2000). Data from both hypothetical scenarios and actual litigation support the role of framing in litigation. (Guthrie, 2003, review).

Further, insurance employees should be able to avoid the lure of framing effects when evaluating litigation. For an insurance company, all lawsuits involve losses. Indeed, the entire claims process is one of paying out, and hence losing. But to insurance companies, payouts are the cost of doing business. They are not truly losses, any more than paying for jet fuel consists a psychological loss for an airline. Insurers are the consummate repeat players in litigation and we would expect that they have managed to see the process in more rational terms than most litigants.

1. Framing Study #1:

We presented the insurance claims adjusters in the Connecticut conference a short scenario requiring them to evaluate a settlement offer. The scenario, entitled "Case Evaluation: Settlement Decision", described an auto accident in which the defendant is clearly at fault, but the circumstances of the accident made insurance coverage uncertain. The materials asked the participants to assume that they managed the insurance company and had to make a decision whether to litigate the issue of insurance coverage or accept a settlement that would leave them covering 2/3 of the underlying claim. The materials indicated that the underlying claim was worth $300,000, that the coverage issue was 50% likely to come out either way, and that the case would cost $60,000 to litigate through to a verdict. Thus, the settlement offer had an expected cost of $200,000, while litigating had an expected cost of $210,000.

The participants read one of two versions: a gains version and a loss version. In the gains version, the materials indicated that state law allowed the plaintiff to sue the insurance company directly, which they had done. In effect, the insurance company would have to sue the insured party in order to litigate the issue of insurance coverage. In the losses version, the plaintiff simply sued the insured party and the insured party had named the insurer as a co-defendant. In effect, the only difference is which party would first have to pay the plaintiff and then recover from the other. The gains frame cast the insured as the stakeholder while the losses frame cast the insurer as the stakeholder.

The materials read as follows:

> Suppose that you are a manager of an insurance company. Your company is the primary liability insurer of PDQ Company, a package-delivery company. One of PDQ's drivers recently injured a pedestrian while making a delivery. Police reports indicate that PDQ's driver was high on marijuana at the time of the accident.
>
> [GAINS Because the laws of the state in which the accident occurred allow accident victims to sue the insurer of alleged tortfeasors directly, the pedestrian has filed suit against your company. Your lawyers have named PDQ as a co-defendant because insurance coverage is unclear in this case.
> LOSSES The pedestrian has filed suit against PDQ, and PDQ has named you as a co-defendant because insurance coverage is unclear in this case. ]
>
> According to your lawyers, it is clear under the laws of the state in which the accident occurred that PDQ is liable for its driver's conduct (even though it was unauthorized). It is not clear, however, whether PDQ is entitled to claim coverage under the insurance policy. If PDQ is found directly liable to the pedestrian for negligently failing to monitor the driver, PDQ is entitled to claim insurance coverage. If PDQ is found only vicariously liable for employee actions on the job, PDQ is not entitled to claim insurance

coverage. Your insurance company lawyers tell you that there is about a 50% chance that a court would find that PDQ is covered (in which case you will have to pay for plaintiff's damages) and a 50% chance that it would find that PDQ is not covered (in which case you will not). Litigating this issue would cost your company $50,000.

The pedestrian has informed [GAINS: you/ LOSSESS: PDQ] that he will accept $300,000 to settle the case. You and PDQ think this is a good settlement given the nature of his injuries, so you have agreed that the pedestrian should be paid the $300,000.
[GAINS: PDQ has offered to pay you 1/3 of this amount (i.e., $100,000) to settle your claim against them on the issue of insurance coverage.
LOSSES: PDQ has offered to accept 2/3 of this amount from you (i.e., $200,000) to settle their claim against you on the issue of insurance coverage. ]
What should you do?

The gains frame offered the participants two options: "Agree to accept the payment of 1/3 of the liability from PDQ as a settlement with PDQ"; "Reject the payment of a 1/3 share and contest the full $300,000 claim with PDQ." The losses frame also offered the participants two options: "Agree to pay 2/3 of the liability as a settlement with PDQ"; "Reject paying a 2/3 share and contest the full $300,000 claim with PDQ."

The results revealed no differences between the two conditions. In the gains frame, 75% (15 out of 20) of the participants agreed to the sure option of accepting the settlement. In the losses frame, 69.6% (16 out of 23) of the participants agreed to the sure option of accepting the settlement. These conditions did not differ significantly, and showed no real trend towards a difference. Also, unlike many of the previous studies of suit and settlement in which a majority of the subjects reject settlement offers slightly greater than the expected value, most participants in this study accepted the settlement offer.

2. Framing Study #2

In our second framing study, we presented half of the reinsurance executives with a litigation question arising from the nature of reinsurance.[7] The scenario, labeled, "Settlement Evaluation" provided a brief set of facts, listed below, documenting a dispute between a primary insurer and a secondary (reinsurance) company. The materials asserted that the dispute arose out of an ambiguity as to whether punitive damages were covered by the reinsurance agreement. The primary insurer paid the claim and then sued the reinsurer to cover the claim. The materials either described the suit from the perspective of the primary insurance company or from the reinsurer. The primary insurer was the non-stakeholder, and thus the primary insurer perspective was the gains frame. The reinsurer was the stakeholder, and this the reinsurer perspective was the loss frame.

[7] The other half received framing study #4, described below.

The materials then asked the participant to decide whether to accept a settlement offer. In both frames, the underlying claim was for $200,000, the stated likelihood of victory was 50%, and the cost of litigating through trial was $60,000. The settlement offer in both cases was $10,000 better than the expected value of the trial. In the gains frame, the participant had to decide to accept or reject an offer to pay $60,000 to settle the case, whereas in the loss frame, the participant had to decide to accept or reject an offer to accept $140,000 to settle the case.

The materials consisted of the following:

> [GAINS Suppose that you work for Primary Insurance Company ("Primary") and that your company is in a dispute with Secondary Reinsurance Company ("Secondary").
> LOSSES Suppose that you work for Secondary Reinsurance Company ("Secondary") and that your company is in a dispute with Primary Insurance Company ("Primary").
>
> The dispute arose as follows: Your company settled a case for $400,000 on behalf of an insured. Your company then sought reimbursement of $200,000 from Secondary under the two companies' reinsurance agreement. Secondary refused to pay, arguing that your company's settlement payment was primarily for punitive damages and that the reinsurance agreement did not contemplate that Secondary would reimburse your company for punitive damage payments. Your company disagrees.
>
> After several months, your company filed suit against Secondary, seeking payment of the $200,000. Based on careful research, a review of the reinsurance contract, and an analysis of the judge who will hear the case, your attorneys believe that your company has a 50% chance of winning the full $200,000 at trial and a 50% of winning $0. They expect that the attorneys' fees at trial will be about $50,000. Immediately prior to trial, Secondary has offered to pay $60,000 to settle the case.

In the gains frame, the participants were asked: "Will you accept the $60,000 payment to settle the case?" In the losses frame, the participants were asked: "Will you agree to pay $140,000 to settle the case?"

The results suggested little difference between the two conditions. In the gains condition, 50% (10 out of 20) subjects accepted the settlement. In the losses condition, 65% (13 out of 20) accepted the settlement. This difference suggests a trend towards a greater desire for certainty in the losses condition (contrary to the hypothesis), but the trend was not significant. ($p > .5$, by Fisher's exact test).

As with the first framing problem, the results failed to show any effects of the decision frame. This result stands in sharp contrast to that reported by Rachlinski (1996). Using similar numbers ($400,000 case, 50% chance of winning, settlement offer of $200,000), Rachlinski found a huge difference by frame among law students: 77% chose to settle when facing gains, versus 31% when facing losses. Sitting judges evaluating identical numeric offers likewise demonstrated a significant difference in their evaluations of acceptability of settlement offers by frame. (Guthrie,

Rachlinski & Wistrich, 2001). In their study, Guthrie et al found that 39.8% of the judges evaluating the gains frame accepted the settlement, as comparted to 25% of the judges evaluating the loss frame. The reinsurance executives however, seemed to be insensitive to frame and highly inclined to settle. If anything, these participants showed an opposite trend.[8]

3. Framing Study #3

To facilitate the comparison with other groups, we presented a scenario to insurance claims adjusters at the Missouri conference, that was similar to that used by Rachlinski (1996) on law students and to that used by Guthrie, Wistrich and Rachlinski (2001) on sitting judges. The scenario, labeled "Suit and Settlement" asked the participants to suppose that they were acting as counsel for one of the parties in a copyright action. The participants either evaluated the case from the plaintiff's perspective (gains frame) or the defendant's perspective (loss frame). The economics of the settlement offer were identical to study #2; $200,000 at stake, a 50% chance of winning, $50,000 in attorney fees, and settlement offers that were $10,000 greater than the expected stakes in litigation.

Copyright presents a particularly compelling case for framing. The real issue is who owns the money earned through the use of a piece of intellectual property. Regardless of status as plaintiff or defendant, the issue is how to divide these gains. Nevertheless, one party begins the lawsuit as the stakeholder while the other is attempting to assert a claim to those stakes. This feature creates the frame.

The materials were to those used by Rachlinski (1996) and almost identical to those used in Guthrie, Rachlinski, and Wistrich (2001). As compared to Rachlinski (1996), the materials included details on the finances of the companies, identified the attorney's fees, and includes stakes that were half as large. As compared to Guthrie et al. (2001), the materials simply cast the party as a counselor evaluating a settlement offer, rather than as a judge evaluating a settlement offer. The materials were as follows:

> Imagine that you are [GAINS: plaintiff's/LOSSES: Defense] counsel in a case in which a plaintiff has sued a defendant for $200,000 in a copyright action. Both the plaintiff and the defendant are mid-sized publishing companies with annual revenues of about $2.5 million per year. You believe that the case is a simple one, but it presents some tough factual questions. There is no dispute as to the amount at stake, only as to whether the defendant's actions infringed on the plaintiff's copyright. You believe that the [GAINS: plaintiff/ LOSSES: Defendant] has a 50% chance of [GAINS: recovering/LOSSES: losing] the full $200,000 at trial and a 50% chance of [GAINS: recovering/LOSSES: losing] $0. You expect that should the parties fail to settle, each will spend approximately $50,000 at

[8] This trend might have arisen from the greater familiarity with evaluating the reinsurance condition than the insurance condition among these participants.

trial in litigation expenses. Assume that there is no chance that the losing party will have to compensate the winner for these expenses.

The case is approaching a trial date. The [GAINS: defendant/LOSSES: plaintiff] has offered to [GAINS: pay the plaintiff $60,000/ LOSSES: accept $140,000] to settle the case. Would you recommend that your client [GAINS: accept/LOSSES: agree to pay] the settlement?

The participants expressed a marginally significant framing effect. Among the participants evaluating the gains frame (plaintiff's perspective), 64.3% (18 out of 28) agreed to settle. Among the participants evaluating the loss frame (defendant's perspective), 40.0% (12 out of 30) agreed to settle. The difference was marginally significant. Fisher's exact p = .075.

Table 1, below, presents a comparison of this result to populations of law students (from Rachlinski, 1996) and judges (from Guthrie et al, 2001). As compared to law students the magnitude of the framing effect, as measured by the difference between the settlement rate in the gains frame as compared to the losses frame, was much smaller among insurers. This difference was marginally significant. (Loglinear analysis, G2= 9.31, p =.06). Judges displayed a framing effect that was numerically small, but statistically significantly different from that of insurers (owing to the larger sample size). (G2= 14.25, p <.01).

Table 1: Settlement Rate (in %) in Copyright Dispute Among Three Different Groups (and sample size, n)

| Condition | Insurers (Present Study) (n= 58) | Law Students (Rachlinski, 1996) (n=26) | Judges (Guthrie et al., 2000) (n=163) |
|---|---|---|---|
| Gains | 64.3 | 76.9 | 39.8 |
| Losses | 40.0 | 30.8 | 25.0 |
| Framing Effect (Gains - Losses) | 24.3 | 46.1 | 14.8 |

There are several reasons why insurance claims adjusters, even if they express a strong resistence to framing effects, might have had problems with this hypothetical. First, we did not ask them to undertake their role as insurers, but instead asked them to act as an attorney. The role of an attorney facilitates identification with the client's perspective (Babcock et al, 1993), which might undo the mechanisms insurers develop to avoid framing. They might have come to feel "inside" the problem, rather than evaluate it from the perspective of an insurer who see the problem as just one of many. Judges, who have witnessed many disputes of this sort from the perspective of an outsider, evidenced a smaller effect. Second, the underlying problem was unfamiliar. Although business

insurance might cover a copyright claim in some instances, this would be an unusual case for insurers used to assessing tort claims. Furthermore, the participants did express a smaller framing effect than other populations.

The results, however, suggest a certain degree of specificity of the mechanisms that people develop to avoid the adverse effects of framing. The first two scenarios called upon insurers to evaluate insurance claims. Claims always cost insurers money, they never involve gains. Evaluating when to pay a claim and how much of it to pay nevertheless requires adopting a risk-neutral perspective. Acting as counsel for a party in a copyright dispute, however, is a different task. The risk-neutral perspective that the parties adopted to evaluate the insurance claims did not translate into a generic ability to ignore frame.

4. Framing Study #4

In our fourth study of framing among insurers, we tested whether risk-neutrality participants expressed in studies 1 and 2, above, would translate into a different insurance context. To do this, we translated one of Tversky and Kahneman's (1984) demonstrations into the insurance context. (See Mandel, 2001, for a critique of this problem). The materials, entitled "Litigation Risk Analysis" asked participants to evaluate a pattern of potential liability risks, rather than a single case. We presented it to half of the reinsurance executives and all of the Missouri claims adjusters.

The materials cast the participants in the role of advisor to a company concerning litigation risks. The materials asserted that the company faced two potential options: one that had a 1/3 chance of avoiding any liability, and a 2/3 chance of liability for 600 deaths; one that created liability for 200 death for sure. The options were either presented either as potential improvement in liability risk or as potential increases in liability risks.

The materials consisted of the following description:

> Suppose that you have agreed to advise a large biotechnology company on a liability concern. This company has distributed a vaccine against a disease known as "river fever." This disease kills hundreds of thousands of people each year in developing countries. Although the vaccine will dramatically reduce the prevalence of this illness, the company has now learned that the vaccine will cause about 600 people to die from serious adverse allergic reactions. These individuals might be able to recover damages against the company. Fortunately, the company has determined that it can distribute one of two drugs to counteract this risk. (The two drugs interact badly with each other, so only one can be used.) The company would like you to recommend which of the two drugs it should distribute, based on the following information. (please check one only):

The materials in the gains frame asked the participants to select among the following two choices:

-If drug A is distributed, 200 people will be saved from the allergic reactions.

-If drug B is distributed, there is a 1/3 chance that 600 people will be saved from the allergic reactions and a 2/3 chance that no people will be saved.

The materials in the loss frame asked the participants to select among the following two choices:

-If drug A is adopted, 400 people will die from the allergic reactions.

-If drug B is adopted, there is a 1/3 chance that no people will die from the allergic reactions and a 2/3 chance that 600 people will die.

Table 2, below, presents the results. Overall, the materials produced a strong framing effect. Participants in the gains condition were significantly more likely to accept the sure outcome than participants in the loss condition. (Fisher's exact, $p < .001$). The effect was significantly smaller among the claims adjusters ($G2 = 18.56$, $p < .001$). Analyzing the results separately, although the frame had a significant effect on the reinsurance executives (Fisher';s exact, $p < .005$), the effect was not significant among the claims adjusters (fisher's exact, $p = .18$).

Table 2: Percent Accepting the Sure Option by Group and Condition (and sample size)

| | Reinsurance Executives | Claims Adjusters | Combined |
|---|---|---|---|
| Gains | 85.7 (14) | 53.6 (27) | 65.8 (41) |
| Losses | 21.7 (23) | 35.4 (31) | 29.6 (54) |
| Framing effect (Gains - Losses) | 64.0 | 18.2 | 36.2 |

These results demonstrate that employees in the insurance industry are not immune from framing effects, even within the context of assessing the kinds of risks insurers must assess. Assessing litigation risk is well within the type of problem that insurers must manage in a risk-neutral fashion. In particular, the sizeable effect among the reinsurance executives suggests a vulnerability to some types of problems that insurers must assess. Furthermore, the effects are comparable to those reported by Tversky and Kahneman (1984) among undergraduates evaluating the same problem. Tversky and Kahneman found that 72% of their subjects presented with the gains frame preferred the sure option, versus only 22% of the subjects presented with the the loss frame ( a 50 percentage point difference).

The lack of a significant effect among the insurance adjusters is interesting, particularly as contrasted with the results for the reinsurance executives. One might have thought that the kind of

problem was more amenable to the reinsurance business than the primary insurance business. It presents a fairly high level risk of the sort that reinsurance companies must assess. Reinsurance companies, however, do not typically advise clients on ways of reducing risk, unlike primary insurers. A primary insurer can earn substantial revenue by first selling an insurance policy and then advising a customer on ways of reducing the risks associated with the policy, within its terms. Reducing such risks might force the insurer to reduce policy rates for future terms, but so long as the risks continue to decrease, both the insurer and the insured (not to mention third parties) will be better off. Thus, unlike reinsurance firms, primary insurers do commonly assess litigation risks, and provide advice to their customers. This experience might explain some of the differences observed between the two groups.

5. Discussion of Framing Studies

Overall, the framing studies demonstrated a degree of resistance to framing among those with experience in the insurance business, relative to laypersons. The first two scenarios revealed that experienced employees in the insurance business assess settlement offers in a fashion that is much more consistent with rational choice theory than laypersons have been show to be able to manage. The ability to adopt a risk-neutral perspective and see litigation as a cost of doing business is fundamental to the insurance industry, and the participants in our study seemed to have mastered it. Furthermore, in the direct comparison we conducted with other populations in study 3, the participants in this study fared well, even though they were influenced by frame. To be sure, they were not as risk-neutral as judges, but that failure might stem for the unfamiliarity of the task.

The fourth study, however, produced some more troubling results for the insurance industry. This study tested the participants' ability to adopt a risk-neutral perspective when evaluating aggregate risk. Here, the participants did not fare as well. Although the claims adjusters evidenced only a trend towards an influence of frame, the reinsurance executives were as influenced by the decision frame as undergraduates. This results suggests that despite real ability to see beyond the frame, framing remains a powerful influence on judgment of risks among insurance employees. The ability to see past frame may not be a wholesale cognitive skill that insurers have adopted. Rather, the results suggest that the ability to assess a problem in a more risk-neutral fashion is highly task specific.

The ability of insurers to adopt risk neutral perspectives in litigation is significant for the general practice of litigation. Insurers are consistently the stakeholders in litigation, who constantly negotiate against individuals trying to make claims on these stakes. If the individuals lack the ability to see beyond the decision's frame, then they will make risk-averse choices about settlement accepting less than the expected value. In contrast, insurers seem to be able to adopt risk-neutral perspectives. The clearer perspective on litigation that this power facilitates would enable insurers to take advantage of some of the risk-aversion by the plaintiffs, by negotiating over settlement offers that far well below the expected value of litigation. In a negotiation between an individual and an insurance claims adjuster, these results predict a relatively low settlement.

Interestingly, as contrasted with uninsured defendants, insurance companies might actually offer more equitable settlements than ordinary defendants. The previous work on framing and settlement suggests that defendants are risk-seeking, leading them to make particularly stingy settlement offers and to reject sensible offers from plaintiffs. (Rachlinski, 1996). This tendency can produce either an impediment to a negotiated resolution of the dispute or to settlements that are even lower than the expected value of the suit. A negotiation between a risk-averse plaintiff and a risk-seeking defendant is apt to be much worse in terms of settlement ability and equity of the settle meant than a negotiation between a risk-averse plaintiff and a risk-neutral defendant. Thus, the ability of the insurers to see past the frame might, on the whole, be a socially beneficial cognitive skill.

C. Representativeness and Intuitions About Risk

An understanding of and appreciation for statistical concepts are central to the pricing of insurance policies. Ordinary intuition on statistical inferences can be misleading. Lay people tend to rely heavily on heuristics that can distract them from making mathematically correct statistical inferences. Even to those trained in statistical inference processes, inferences that "seem" right are commonly mistaken.

The most well-documented of the heuristics that leads people astray in statistical inference processes is the representativeness heuristic. As discussed in the introduction, the representativeness heuristic refers to the tendency to judge the likelihood that some event or item is part of a broader category based solely on the degree of similarity between the event or item and the category, rather than on statistical likelihoods. Similarity is indeed a good clue to such a judgment, but it can be misleading.

Employees of the insurance industry, more so than other people, should be able to perform well on tests involving statistical inferences. The nature of pricing risks requires attention to actuarial tables and background statistics. Reliance on misleading intuition can lead to ruinous pricing decisions for an insurance company. Either an event might seem too likely, thereby creating an opportunity for one's competitors who rely on actuarial tables, rather than intuition, or an event might seem too unlikely, thereby leading to underpricing.

We tested for the presence of several fallacies of statistical reasoning found to be common in laypersons among the participants in our research: base-rate neglect, the conjunctive fallacy, and mistaken intuitions about statistical variance. All arise, more or less, from an excessive reliance on the representativeness heuristic to judge likelihood that would undermine the ability of an insurance company to compete.

1. Base-Rate Neglect

The classic demonstration of the reliance on similarity judgments at the expense of statistical frequency in categorical judgments is the phenomenon known as "base rate neglect."[9] Base rate neglect is best illustrated by the so-called "lawyers-engineers" problem. (Tversky and Kahneman, 1973). The problem consists of a "personality sketch" of an individual, said to be drawn either from a population of 70 lawyers and 30 engineers or 30 lawyers and 70 engineers. The subjects are asked then to assess the probability that the individual is a lawyer or an engineer. Although the proportions in the background population should influence the subjects' assessments, they have little effect. For example, consider the reactions of the subjects given the following, vague description:

> Dick is a 30 year old man. He is married with no children. A man of high ability and high motivation, he promises to be quite successful in his field. He is well liked by his colleagues.

Tversky and Kahneman found that, regardless of the background statistics, people judge the probability that Dick is a lawyer or engineer at 50%. Tversky and Kahneman reasoned that the subjects believed (quite reasonably) that the vague description offered no clue as to Dick's profession. They neglected Bayes Rule, however, by failing to adopt the background statistics as their likelihood estimate.

We adapted this problem for presentation to the insurance claims adjusters at the Connecticut conference. Specifically, we wanted to see whether the insurers, used to processing actuarial information, would be able to attend to base rates in a familiar context. To do this, we created a brief description of a medical malpractice case, entitled "case Evaluation Problem: Likelihood of Success at Trial." We provided the participants with a vague description of a medical malpractice case, and some background statistics on the success rate of defendants (doctors) in similar medical malpractice claims in the jurisdiction. We identified this success rate as either being 35 out of 50 recent cases (70%) or 15 our of 50 recent cases (30%).

The materials were as follows:

> Suppose that you have been asked to evaluate medical malpractice cases using sparse information. The case involves an allegation that a doctor performed an operation without the informed consent of the patient. Your records indicate that in the past 20 years, 50 informed consent cases involving surgeons have been tried before juries in this jurisdiction, [35/15] of which have resulted in verdicts for the doctor.
>
> Consider the following details: This case arose from the doctor's removal of the patient's vocal chords during a surgery to remove the patient's thyroid gland (which had become cancerous). The doctor removed the vocal chords because, upon visual inspection, he felt that they were also likely to be cancerous. The doctor contends that the removal was

[9] Base rate neglect is much discussed and debated. See Koehler, 1999 for a review.

consistent with standard medical practice and that it prevented the patient from having to undergo a second surgery. The patient alleges that the doctor knew that she worked part-time as a professional singer and would have preferred alternative treatment for her vocal chords.

We then asked, "The probability that this doctor will win this lawsuit is _____%" We also asked the participants to assess: "How useful were the details provided in estimating the likelihood of winning?" by checking one of four lines, labeled "useful", "somewhat useful", "Not very useful", and "Almost completely useless." All but a handful of the participants checked one of the two middle categories. No differences between these groups proved to be meaningful in the analysis.

Table 3, below, reports the results. The mean expected likelihood of winning was 33.6 percent in the 30% base-rate condition and rose to 50 percent in the 70% base-rate condition. These two differences were statistically significant. Two-sample $t(32) = 2.49$, $p < .02$. Unlike Tversky and Kahneman's undergraduate subjects, the insurance claims adjusters attended to the base rate.

Table 3: Mean, Median, and sample size for the two odds ratios.

| Condition | Mean | Median | N |
|---|---|---|---|
| 30% win for D | 33.6 | 30 | 26 |
| 70% win for D | 50 | 55 | 18 |

At the same time, they did not comport themselves entirely in accord with Bayes Theorem. The participants in the 30% condition acted as if the details of the case were irrelevant, but the participants in the 70% condition acted as if the details made the case a less promising one for the doctor than the base rate suggests. Either inference would be defensible, but not both. That is, if the details were irrelevant (as participants in the 30% condition expressed), then the participants in the 70% condition should have felt the same way and identified 70% as the best estimate of the outcome. Alternatively, if the details made the case a less promising one for the doctor (as participants in the 70% condition expressed), then the participants in the 30% condition should have identified a lower likelihood of winning (specifically, it would have been 18%, if it were in perfect accord with Bayes Rule).

These results suggest that insurance employees are better able to process actuarial information than laypersons. Their thinking does not perfectly match accurate statistical inferences, but it is much closer than in laypersons. Insurance employees do not, it seems, ignore base rates. This would give insurers a tremendous advantage in assessing risk, relative to laypersons. This ability would provide a much clearer assessment of likely outcomes than laypersons that would enable them to assess settlement proposals and price policies more accurately than laypersons.

2. Conjunction Fallacy, Part I

Relying heavily on similarity to judge frequency can have some unusual effects on judgment. Notably, it can produce what psychologists have called the conjunction fallacy. The conjunction fallacy is the tendency for the conjunction of two events to seem more likely than one of the disjoint parts. For example, consider the following description of a woman named Linda (Tversky and Kahneman, 1983):

> Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and participated in anti-nuclear demonstrations.

In rating likely characteristics of Linda, many subjects rate the statement "Linda is a bank teller active in the feminist movement" more as more likely to be true than the statement "Linda is a bank teller." As a matter of deductive logic, the latter includes the former and therefore must be more likely. (But see Gigerenzer, 1991, f or a critique of this study). Because the former description seems to match Linda's characteristics more closely than the latter, the later is rated as more plausible.

Experts seem also prone to committing the fallacy. In one study, a group of geologists rated the likelihood that a "flood caused by an earthquake would kill 100 people in California in the next year" as more likely than a "flood caused by an earthquake would kill 100 people in the United States in the next year." Once again, the event seems more like something that would occur in California than the United States. For many people, earthquakes are a salient characteristic of California, but earthquakes are not such a salient characteristic of the United States. Hence, the specific event matches the category's features well, and therefore seems more plausible.

If insurance employees are better at assessing risk than ordinary people, they should not suffer from the conjunction fallacy to the same extent. Falling prey to the conjunction fallacy requires a reliance on impressionistic assessments of risk, rather than actuarial realities. Experience with actuarial approaches to risk assessment might thus allow insurers to develop better ways of assessing risk than reliance on similarity judgments. It is worth noting that Tversky and Kahneman (1983) reported that specific training in statistical reasoning had little effect on whether subjects committed the conjunction fallacy. They noted that subjects with no statistical training, subjects with a graduate-level training in statistics, and subjects who had completed a business school course on decision analysis were roughly equally likely to commit the conjunction fallacy when evaluating "Linda". In all cases, roughly four out of five committed the fallacy. The present study tests whether in the field experience is superior to actual training.

To test whether insurance employees develop better risk assessment skills that allow them to avoid the conjunction fallacy, we administer three different questions to the participants in our study. Two were similar, and we report them in this section.

First, we asked reinsurance executives to rank a set of risks by likelihood. The risks were all ones that are commonly the subject of reinsurance contracts. Within the list of five risks were embedded a pair of risks that test for the conjunction fallacy; meaning, one risk was a more specific risk than the other. Selecting the specific risk as more likely than the general risk would indicate that the participant had fallen prey to the conjunction fallacy. The structure of the question mimicked that used by Tversky and Kahneman (1983) in assessing "Linda" and several other problems.

The question, labeled "Evaluation of the Relative Risks of Disasters" began with the following background:

> The National Earthquake Information Center of the United States Geological Service reports that the United States had 28,692 earthquakes during the 1990s, many of which hit California. Fortunately, only 11 of the earthquakes in the U.S. during the 1990s had magnitudes measuring 7.0 or greater on the Richter scale.
>
> Please assess the likelihood that the following will occur during 2002. Please do so by ranking these events based on probability, using "1" for the most probable event, "2" for the second most probable, "3" for the third most probable, "4" for the fourth most probable, and "5" for the least probable event.

The materials then provided the following five options, in this order:

-An earthquake will strike Southern California.
-An earthquake that causes more than $3 billion in property damage will strike the U.S.
-An earthquake that kills more than 500 people will strike the U.S.
-An earthquake with a magnitude of 7.0 or higher will strike the U.S.
-An earthquake will strike Southern California that kills more than 500 people

The materials actually included two potential sources of the fallacy. Item 5 is a subset of both item 1 and item 3. Item 1, however, was a mere distractor. Given the background facts, it is almost certainly the most probable. Item 3, however, might have seemed less probable than item 5, even though logically, item 3 is more probable.

Only 29.3% (22 out of 75) of the participants committed the conjunction fallacy.[10] In Tversky and Kahneman's (1983) demonstration of the conjunctive effect, they tested several different items, none of which produced less than a 68% rate of committing the fallacy. Thus, the reinsurance executives in our study seemed much better able to avoid the fallacy.

[10] Note that 11 participants did not respond to this item.

We presented a similar problem to the group of claims adjusters in Missouri. In this problem, we shortened the background somewhat. The problem, labeled "Relative Likelihood of Various Disasters", included only the following introduction:

> Please evaluate the probability of the following events that might occur in the years 2001-2005. Please do so by ranking these events by probability, using "1" for the most probable event , "2" for the second, "3" for the third, and "4" for the least probable event.

The materials then listed the following events:

> -A hurricane that causes more than $20 billion in property damage will strike the United States
> -An earthquake of magnitude 7.4 on the Richter scale will strike the Los Angeles area, causing more than $5 billion in property damage
> -A hurricane of category 5 on the Saffir-Simpson Hurricane Scale (wind speeds of greater than 155 mph) will strike the United States, causing more than $20 billion in property damage
> -A successful terrorist attack on an American city will cause more than $100 million in property damage

In this problem, item 3 is a subset of item 1. Committing the conjunction fallacy would thus consist of ranking item 3 as more likely than item 1.

Only 20.5% (9 out of 44) of the participants in this study committed the conjunction fallacy. Of the nine who did, four actually rated the two as equally likely (which we scored as an error.) Once again, the rate was well below that found by Tversky and Kahneman.

These results suggest that insurers and reinsurers alike do not see risk the same way as lay persons do. Although some participants erred, and fell prey to the conjunction fallacy, the overall rate of this mistake was far lower than that observed among both naive subjects and students trained in decision analysis. The participants in this study, unlike that of base rate neglect, did not merely choose to use statistics over intuition. We did not make statistics available in this study. Rather, they seemed able to see the problem as one involving logical deduction and ranking, rather than one that called for an assessment of which risk "felt" more plausible. Insurance employees seemed able to adopt the perspective on risk assessment needed to facilitate accurate analysis of risks.

3. Conjunctive Fallacy, Part II.

We also presented a third test for the presence of the conjunction fallacy to reinsurance executives and claims adjusters. This time, we chose a between-subjects design. The within-subjects design allows the participant the opportunity to view the problem as one involving a variant of set theory, or deductive logic. Avoiding intuition and instinct in favor of logic is the key to a correct answer in the within-subject study. The insurers were apparently able to see the problem this way and succeed as a result. But we wondered what would happen if we eliminated all cues to the correct solution. That is, unlike the base-rate problem, which can be solved largely by fixating on the base rate statistics, and unlike the within-subjects conjunction problem, which can be solved by focusing on the logical structure of the problem, we wanted to know what the participants could do in the complete absence of cues to rational thought. The between-subjects design of the conjunctive fallacy problems allowed us to assess this.

The between-subjects design is simple. Participants are asked to rate the likelihood of one of two events, one of which is a subset of the other. The study involving geologists evaluating the risks of an earthquake-caused flood, described above, represents one example of this kind of study. (Tversky and Kahneman, 1983). The participants in that study either estimated the likelihood of such a disaster occurring in the United States or in California. That the mean was significantly higher among those evaluating California reveals that the salient features of California are driving the probability assessment, rather than the true underlying likelihoods.

In our study, we asked the participants to assess the probability of two different risks, that of a terrorist attack and that of a severe hurricane. We also asked participants to estimate either a general or a specific version of the risks. We gave all subjects a time frame of five years for the event to occur. Our general versions asked participants to provide a probability estimate for the likelihood that: "A hurricane will strike the United States and cause more than $10 billion in property damage" and "A terrorist attack on an American city will cause more than $1 billion in property damage.". In our specific versions, we substituted "Florida" for the "United States" and "New York City" for "an American city", respectively. Participants in the reinsurance study all evaluated either the general or the specific risks, whereas conditions for the claims adjusters were randomized.[11]

Table 4, below, presents the results. The results generally evidenced little in the way of a conjunction fallacy. In no pairing did the mean estimate for the specific condition exceed that of the general condition by more than one percentage point. Furthermore, in most of the pairs, the mean for the general condition exceeded the estimate for the specific condition.

Table 4: Mean Percentage Likelihoods by Question and Population (and sample size)

[11] This was because we observed an unexpected, significant correlation between the two numbers in the first study.

| Question | Reinsurance | | Claims Adjusters | | Total | |
|---|---|---|---|---|---|---|
| | Mean | (n) | Mean | (n) | Mean | (n) |
| Hurricane-US | 40.0 | 41 | 44.6 | 27 | 41.8 | 68 |
| Hurricane-FL | 33.8 | 38 | 45.6 | 30 | 39.5 | 68 |
| Terrorism-US | 17.8 | 41 | 47.1 | 21 | 27.7 | 62 |
| Terrorism-NYC | 16.5 | 37 | 29.7 | 35 | 22.8 | 72 |

The results were analyzed with a three-way (2x2x2) ANOVA, with factors of condition (general versus specific), population (reinsurance versus insurance), and subject-matter (hurricane versus terrorism). The specific conditions, in fact, generated a non-significant trend towards smaller estimates than the general conditions. $F(1, 261) = 2.85$, $p = .09$. The other main effects (subject matter and population) were also significant, although these results were not of direct interest to the hypothesis. The analysis also revealed a nearly significant interaction between the population and the subject-matter. $F(1, 261) = 3.69$, $p = .06$. This result occurred because of greater probability estimates for terrorism among the claims adjusters. Finally, there was a trend towards a three-way interaction. $F(1, 261) = 2.69$, $p = .10$. This result resulted largely from the larger gap between the general and specific conditions among the claims adjusters evaluating terrorism than the gaps in the other conditions.

The results revealed that the participants essentially engaged in no real conjunction fallacy. Overall, participants gave higher probability estimates for the occurrence of the general category than the specific category. The best one could say is the results reveal two pairings in which the probability estimates are essentially identical. That is, reinsurance executives rated the probability of a terrorist attack in New York City as being essentially as likely as a terrorist attack in the United States. Similarly, the insurance claims adjusters rated the likelihood of a hurricane hitting Florida as equivalent to the likelihood of a hurricane hitting the United States. These event pairs cannot be equally likely, any more than the nested event can be more likely. Furthermore, across all of the subject matter and population pairs, the specific condition is high relative to the general condition. Only if 84.5% (33.8 out of 40) devastating hurricanes strike Florida can the reinsurers be said to have provided reasonably accurate assessments.[12] Similarly, only if the likelihood of a major terrorist attack being in New York City conditional upon an attack is 63.1% were the insurers giving estimates unaffected by a representativeness judgment (little can be said about whether this is reasonable or not). Even if the high estimate sin the specific conditions are thought of as a conjunction effect, however, the effects are small relative to those observed in undergraduates, and other experts. (Tversky and Kahneman, 1983). Even in the absences of obvious ways of pursing a rational conclusion, insurers resisted relying on misleading impressions

[12] Note: there is actual data on this, may want to cite it.

The three-way interaction between the type of question , the population, and the condition provides some insights into the nature of the superior judgment these participants demonstrated. Specifically, although the reinsurers showed somewhat more resistance to the effects of specificity when addressing terrorism than addressing hurricane risks, the insurers demonstrated the opposite pattern. Reinsurance firms historically have written policies to cover both types of events, but as to hurricanes, the participants in our study, who responded before the 9/11 attacks, had much more experience with hurricanes than with terrorism. At the time, much more of their energy and cognitive effort in their business would have been spent assessing hurricane risks. The insurance adjusters do not generally write policies to cover these risks, but events like hurricanes and terrorist attacks affect the casualty policies that they do write. This group of insurers, based in the Midwest where the risk of hurricane damage is remote, acting after the 9/11 attacks, would have spent more of their cognitive effort assessing the impact of potential terrorist attacks than hurricanes. In effect, both groups displayed a greater ability to assess the risks that were more salient to their businesses.

4. Intuitions Concerning Statistical Variance: Insensitivity to Sample Size

In previous research, Tversky and Kahneman (1973) found that undergraduates commonly fail to appreciate the relationship between sample size and variance. As a matter of simple mathematics, the greater the sample size, the smaller the variance. Furthermore, the smaller the variance, the less likely that an aberrant mean result will be obtained. For those who play tennis, a simple example can illustrate the point: would you be more likely to be able to win a game against a stronger player or a match against a stronger player? A couple of aberrations can allow a weak player to win a game, but it would be surprising if enough aberrations could pile up so as to facilitate victory in a game. Tversky and Kahneman showed that, despite the mathematics, people often hold the intuition that variance is unrelated to sample size, or even inversely related.

Specifically, Tversky and Kahneman asked undergraduates a question about sample size and variance. They described two hospitals: a small hospital that witnessed 15 births per day, and a large hospital that witnessed 45 births per day.[13] They asked which hospital was likely to record more days on which 60% or more of the births consisted of male children. Because the larger hospital produces a mean percentage or male children with a smaller variance, it is less likely to witness an aberrant year. Intuition runs to the contrary, however. Most people conclude either that the two are equally likely, or that the larger hospital is more likely. Specifically, Tversky and Kahneman found that only 22.1% of the undergraduates they surveyed correctly identified the smaller hospital as more likely. An identical percentage asserted that the larger hospital was more likely and 55.6% thought it would be the same.

The problem should of great interest to those engaged in the reinsurance business. Reinsurance pricing is tied closely to statistical variance. Primary insurers often must themselves

[13] KST chapter 1, page 6

must purchase insurance against the prospects of a statistical aberration. For example, a primary insurer of automobiles likely prices their coverage to manage the average number of claims in a given year. Suppose that in an ordinary year, this means that they must pay out claims equal to 2% of the total principal covered (assume, for simplicity, that one in twenty cars are completely destroyed by car accidents or theft in any given year). If less than the average number of claims are filed, the insurance company realizes extra profits, but if more than the average number of claims are filed, the insurance company faces a negative balance sheet. Primary insurers must maintain reserves to cover these potential losses, else they will face insolvency. One means of covering excess loss is to purchase insurance against the risk of excess loss. This, in a nutshell, is the reinsurance business. Thus, assessing the likelihood of statistical aberration is critical to reinsurance pricing.

It is worth noting that the concept of statistical variance eludes most people, unless they are asked about more commonly encountered problems. Hence, the example of the tennis player above. Even as people fail to appreciate the relationship between sample size and variance, few tennis players would get the question about winning game versus a match wrong. The natural question provides cues and experience that highlight the true nature of the underlying question. For a member of the reinsurance industry, a question about variance should be as natural as the game-match question for a tennis player.

To test whether reinsurance executives see problems concerning statistical variance differently than others, we administered a reconstructed version of Tversky and Kahneman's "hospital problem" to reinsurance executives. Our version tailored the problem to a reinsurance context. The text of the problem read as follows:

> An insurance company has written insurance policies covering medical malpractice suits for surgery at two different hospitals. The hospitals are essentially identical in terms of the types of surgery they perform and each serves a comparable base of patients, but they differ in size. The smaller hospital conducts 1,500 surgeries a year, while the larger one conducts 4,500. In the past 10 years, a surgery performed at either hospital has a 0.5% chance of resulting in an insurance claim. The insurer for these two hospitals is seeking reinsurance against the risk that one of the hospitals will produce an unexpectedly high number of malpractice claims in a year.

We then asked the participants: "At which hospital is it more likely that the rate of insurance claims will exceed 1% per surgery in any given year? (please check one):" This was followed by three lines that read: "The smaller hospital"; "The larger hospital"; "They both pose about the same risk."

In effect, the problem asks the participants to judge whether the smaller hospital is more or less likely to experience more than 15 medical malpractice claims per year than the larger hospital is to experience more than 45 medical malpractice claims per year. In both cases, the actual

likelihood is low, 18,7% for the small hospital and 6.2% for the large hospital, but the odds favor the small hospital. We expected that the reinsurance executives' familiarity with variance, which is arguably essential to their business. would perform better than Tversky and Kahneman's undergraduates.

Table 6, below, reports the results. Of the 81participants who answered the question (5, or 5.8%, did not respond), only 22.2% (18 participants) chose the right answer. A similar percentage, 18.5% (15 participants) chose the larger hospital and 59.3% (48 participants) concludes the odds were the same. These results did not differ significantly from those of Tversky and Kahneman with undergraduates.[14]

Table 6: Number and Percent Selecting Each Option on the Statistical Variance Problem

| Choice | Number | Percent |
|---|---|---|
| Smaller Hospital* | 18 | 22.2 |
| Larger Hospital | 15 | 18.5 |
| Same | 48 | 59.3 |

* correct answer

The reinsurance executives in this study provided results remarkably similar to that of undergraduates. Despite spending their careers managing companies that incorporate the concept of statistical variance into the pricing of their products, these executives saw the problem the same way undergraduates did. Neither can they be said to have been given a misleading set of contextual cues that led them astray. They received the information in the context that would seem most relevant to their companies' mission.

One explanation for the results might be that the usual cause of a variation in reinsurance claims is apt to be systematic, rather than just a statistical aberration. An elevated number of claims against a primary insurer most commonly arises from an underlying cause, such as a rise in crime, a drastic change in economic conditions, a natural disaster, or some other catastrophe. For example, the likelihood that a primary automobile insurer in Miami, Florida will experience an excessive claim rate depends much more on the likelihood of a hurricane than a normal statistical variation. Insuring against such a claim requires more attention to the possibility of an underlying trend, rather than to the natural variance. Our participants might simply have been looking for evidence of a reason to believe in a variation in the likelihood of such a trend between the two hospitals. Finding no reason to suspect such a trend, most of the participants assumed the odds were identical.

[14] Chi-square (2) = 0.37, $p > .5$.

This account of the results suggest that we did, in fact, unwittingly deprive our participants of the kind of context that they are used to seeing. Participants might be using the simple heuristic that if they see no evidence of variation between the two hospitals, then they have no reason to believe the odds would be any different. So long as most of the reinsurance business they underwrite arises from pricing trends, then this heuristic makes some sense. Nevertheless, the results remain an inauspicious one for the business. Some portion of the odds that a reinsurer will have to pay out on a claim arises from the likelihood of an unusual statistical occurrence in the absences of any underlying trend. Reinsurers who fail to appreciate this will misprice their policies. It therefore remains somewhat surprising that the participants scored no better than undergraduates on this task.

5. Discussion of Representativeness

The results of these studies generally demonstrated a superior ability to assess risk among insurers, relative to lay persons. Participants in our study attended to the importance of base rates in assessing risk and expressed a resistence to the conjunctive fallacy seen no where else in the literature. Insurers seemed able to avoid making judgments based solely on similarity. Participants responded to different information in the questions than lay persons. In addition to attending to background statistics, they were far more likely than any group previously studied to see the conjunction problem for what it was–a problem involving deductive logic. Even when we asked for individual judgments of probability, the participants seemed much more able to resist the lure of the specific examples to produce coherent judgments. Even as experts in other fields and those trained in decision analysis have fallen prey to such effects, insurers, who must specifically assess risk for a living, do not. Only the apparent inability of the reinsurance executives to assess statistical variance stands out as an example of mistaken judgment in these problems.

The results do not support the proposition that life as an insurer has caused these participants to abandon the kinds of heuristics that ordinary people adopt when assessing risk. Each of the problems we gave display some measure of vulnerability to the errors that reliance on the representativeness heuristic can produce. Insurers did not neglect base rates, but neither did they react to the problem in a manner consistent with Bayes Rule. Likewise, a small, but substantial percentage of insurers and reinsurers committed the conjunctive fallacy by choosing an embedded event as more probable. The probabilities of the specific events are also too high relative to the general events in the between-subjects version of the conjunction problem. Finally, the reinsurers completely failed to display any superiority on evaluating variance.

These results also demonstrate the remarkable degree of specificity of the superior skills that the insurers possess. The reinsurance executives completely failed to show any superiority on the variance task, which we initially found surprising. But, we may have misunderstood the nature of the reinsurance business. The business might not be about providing policies to guard against statistical variance, but policies against unusual, or unexpected events that inflict a systematic risk upon primary insurers. If statistical variance plays little or no role in the reinsurance business, then

reinsurance executives have no need for mechanisms to understand variance properly. In fact, participants in our study did exactly what one might expect from individuals focused on finding systematic trends–they scanned the problem for such trends, and findings none, they assumed the likelihood of deviation was identical. The heuristic of focusing on systematic deviation perhaps has served them so well in their businesses that they were unable to abandon it when the context called for a different mode of analysis. The pattern of results in the terrorism-hurricane problem was even more task-specific. Even though the question are identical in structure, they produce different patterns of result. The more important the risk is to the participants, the closer their risk assessment approximated an accurate perspective.

Thus, the results show that the representativeness heuristic is alive and well in insurers. Relative to laypersons, however, it leads to far less error. Overall, insurers seem to have superior cognitive abilities to laypersons. Furthermore, their superiority seems finely tined to giving them superior judgment in contexts that are more central to their business. Taken together, these characteristics provide insurers with a great advantage over laypersons in accurate risk assessment.

D. Anchoring

When people make numerical estimates, they commonly rely on the initial value available to them. (Tvresky and Kahneman, 1973). The initial value provides a starting point that "anchors" the estimation process. Because people know the initial value is not accurate, they must adjust their final estimate from it. The adjustment is typically insufficient, thereby giving the initial anchor greater influence on the final judgment than as a normative matter it should have. Even absurdly incorrect anchors and anchors that bear no relationship to the final estimate influence choice. (Plous, 1994). It is unclear exactly why anchoring is so powerful. It could arise from the cognitive laziness of failing to adjust the final estimate sufficiently, or it could arise out of the process of assessing to whether the initial estimate is accurate, which reorganizes memory and thinking about the estimate in a way that biases the final judgment. (Epley & Gilovich, 2001, reviewing theories). All agree that the phenomenon is robust, however, affecting many kinds of judgments in many different settings.

In assessing the amount to pay out on a claim, insurers consistently face an anchor–the policy limit. Every insurance policy issued has some numeric cap on the liability of the insurer. Many of the claims made against a policy will be far less than the policy limit, thereby requiring the insurer to ignore the limit and assess the claim's value. But once an insurer is confident that the claim falls within the substantive scope the policy, the first step in claims evaluation is to determine whether the claim likely exceeds the policy limit. If so, then the cheapest, most effective way of dealing with the claim is to simply pay out the policy limit. Anyone who has had the misfortune of being involved in a car accident would recognize this as the assessment of whether a car is "totaled" or not–meaning, does the damage exceed the insured value of the car. Because claims that exceed policy limits are common, and because it saves substantial transaction costs to simply pay the limit, insurers regard this assessment as the first step in evaluating a claim.

What insurers might not recognize, however, is that the process of determining whether the claim exceeds the policy limit introduces a natural anchor into their process. In turn, this anchor might affect their assessment of the ultimate value of the claim. In the absence of an anchoring effect, a claim worth less than the policy limit should not be affected by the policy limit. In other contexts, however, irrelevant anchors affect the judgment of the full distribution of numeric assessments, not merely ons near an anchor. Damage caps in tort suits provide an example of this. A case worth $100,000 should be worth $100,000, regardless of whether it is decided under a damage cap of $500,000 or not. Yet, several studies suggest that high caps will push up the awards and low caps actually push awards down.

For insurers, anchoring would introduce a pernicious distortion in their judgment. A high policy limit might lead insurers to over-value low-value claims, paying out more than is appropriate. Furthermore, a low policy limit might lead to stinginess among insurers, that could impede the negotiations process. In such a case, insured parties might reject the low payouts insurers sincerely believe to be appropriate.

To test for the effects of anchoring among insurers, we conducted two studies designed to test whether policy limits provide anchors: one presented to the Missouri claims adjusters and one to the reinsurance executives. Each included the description of an insurance claim and then one of two policy limits. We also presented a scenario to the Connecticut claims adjusters, but our anchors proved to be much too low, and the vast majority of the participants produced awards greater than the low anchor condition. This obscured any meaningful analysis of the effects of the anchors. This scenario nevertheless provided the basis for the subsequent two studies, by giving us a sense of what insurers felt the underlying claims were worth.

1. Anchoring and Claims Adjusters

To assess the impact of the policy limit as an anchor, participants in the Missouri conference analyzed a claim arising from an automobile accident. We participants with one of two versions, although the only difference between the two was the policy. In one case it was $150,000 and in another it was $500,000. The scenario, entitled “Case Settlement Evaluation”, consisted of the following:

> Suppose you are advising an insurance company client on a claim. The insurer has asked you for a settlement recommendation in the following case:
>
> The insurer sold an auto insurance policy to a small package-delivery company. The policy provided a [$150,000/$500,000] limit on liability for each driver. Unfortunately, one of the drivers, named Dale, was recently involved in an automobile accident involving a 25-year-old graduate student named Perry. Dale's truck sideswiped Perry's car on a wet, spring morning. As a result of the accident, Perry broke three ribs and his right arm. He spent two days in the hospital and missed three weeks of classes. Fortunately, he has fully

recovered from his physical injuries. However, he claims to be suffering from recurring nightmares, "day sweats," and other "episodes of anxiety" as a result of the accident.

The parties have stipulated that the accident was caused solely by Dale's negligent driving. Thus, the only issue in the lawsuit is the amount of damages the insurer should pay pursuant to the liability policy. Trial is imminent.

Participants were first asked, "Based solely on the facts presented, would you recommend the insurer pay the full [$150,000/$500,000] policy limit to settle the case?" then they were asked, "If no, what is the maximum amount you would recommend the insurer pay to settle the case?" None of the participants agreed to settle for the policy limit.

Table 7, below, presents the results. Even though none of the participants settled for the policy limit, and none of the participants concluded that the claim was worth more than the lower limit ($150,000) ,[15] the policy limit influenced the awards. The mean award in the low anchor condition was $51, 379, as opposed to $84,430 in the high anchor condition. This difference (33,051, or 39% of the high anchor mean) was statistically significant. Two-sample $t(29) = 2.71$, $p = .01$. Because the awards were somewhat positively skewed, we also tested the difference using a conservative non-parametric test, but it remained significant. (Mann-Whitney U=659, p =.015.)

Table 7: Mean, Quartiles, and sample size by Condition, in dollars

| Condition | Mean | Median | 1st Quartile | 3rd Quartile | N |
|---|---|---|---|---|---|
| Low anchor | 51,379 | 50,000 | 35,000 | 67,500 | 29 |
| High Anchor | 84,430 | 60,000 | 50,000 | 100,000 | 25 |

These results demonstrate that the policy limit acted as an anchor for the estimate of the case value. Even though the true value of this claim is almost certainly well below the policy limits, the higher anchor pulled up the participants' estimates of the appropriate claim value. Evaluating the claim influenced the participants' thinking about the appropriate value.

Arguably, the claims adjusters could have been acting appropriately in incorporating the policy limit into their assessment of the value of the claim. The claims' value depends, in no small measure, on the likely jury damage award. This award might vary, and even though the mean award might be low, there might be some chance that the award would exceed the policy limit. Inasmuch as insurers would not bear the risk that the award exceeds the policy limit, the insurers should reduce their assessment of the claim value to adjust for the possibility that the award might ultimately exceed the limit. For example, suppose the insurer faced a $200,000 policy limit and was sure that

[15] There might be one or two in the high anchor condition that gave higher than $150,0000–check.

the jury award would either be $100,000 or $250,000 (with an equal probability of each). The expected award would be $175,000, but the expected payout for the insurer would be only $150,000. If the policy limit were higher, perhaps $500,000, then the expected payout would rise to $175,000. We asked the insurers to assess the maximum they would be willing to pay to settle the claim, which should therefore account for the possibility that an ultimate award would exceed the policy limit.

This explanation is somewhat hard to reconcile with the data, however. The claim's value, and hence expected award, is so much less than the policy limits that it is hard to see how insurers could have believed that an award would exceed the policy limit. Furthermore, the pattern observed is that the whole distribution of awards is shifted upwards in the high anchor condition. A sizeable percentage of the participants asserted that the case was worth less than one-quarter of the case value. The participants at this lower end should have been less influenced by the policy limit than those at the higher end. And yet, the distribution simply seems to have shifted. The effect is not driven by those participants who felt that the claim approached the policy limit. Even so, because jury awards tend to be erratic, and skewed positively (Eisenberg et al, 1996), the "rational" account cannot be ruled out.

2. Anchoring and Reinsurance

We presented a similar scenario to the reinsurance executives. Because of the nature of reinsurance, we cast the participants as advisors to a small insurance company. We used anchors that were much higher than in the scenario presented to the claims adjusters, and the extent of the injury we described were more severe than in our previous scenario. Furthermore, we did not ask the preliminary question as to whether the participants should settle for the policy limit. The scenario, entitled "Case Settlement Evaluation", consisted of the following:

> Suppose you are advising a small insurance company on its claims settlement process. The insurer has asked you for a settlement recommendation in the following case:
>
> The insurer sold an auto insurance policy with a [$750,000/$2 million] limit on liability coverage to an individual named David Devine, who injured a pedestrian named Paula Peters in an auto accident. While approaching an intersection, Devine negligently failed to brake his car soon enough and inadvertently hit Peters while she was in the crosswalk. Devine was not driving very fast at the time, but Peters still incurred some injuries. A wife, mother, and homemaker in her early forties, Peters suffered a broken leg, a broken arm, and a concussion. All of her injuries eventually healed completely; her leg and arm healed naturally after five weeks, but the concussion had lingering effects, including occasional headaches and bouts of dizziness that lasted for three months. The lawyer representing Devine and the insurer has informed you that Devine's liability is clear and that the only issue is the liability payment the insurer will pay Peters pursuant to the policy.

The materials then asked: "Trial is imminent. Based solely on the facts above, what is the most that you would suggest the insurer be willing to pay to settle the case and avoid trial? "

The results, described in Table 8, below, showed little effect of the policy limit. Among the low anchor participants, 20.9% (9 out of 43) recommended settling for the policy limit of $750,000 and 18.4% (7 out of 38) of the high anchor participants recommended settling for more than $750,000. The differences in the means was somewhat misleading. It was not significant, although there was a trend. Two-sample $t(30) = 1.48$, $p=.14$. As can be seen from Table, the distribution of the awards did not display the shift observed in the study involving insurance adjusters, and did not mimic the shift common in anchoring studies. The difference in means was driven by a positively skewed tail at the high end of the high anchor condition and the capping of the awards that resulted from the cap that the low anchor placed on settlements. The result of the non-parametric significance test was not close. Mann-Whitney $U=1682.5$, $p = .44$. Furthermore a test on the differences of the mean of the logarithmic transformation of the data that brought it closer in line with a normal distribution revealed nothing like a trend. $t(79) = 0.63$, $p = .053$.

Table 8: Mean, Quartiles, and sample size by Condition, in dollars

| Condition | Mean | Median | 1st quartile | 3rd quartile | N |
|---|---|---|---|---|---|
| Low Anchor | 297.4 | 150 | 100 | 500 | 43 |
| High Anchor | 443.3 | 250 | 100 | 500 | 38 |

These results revealed resistence to anchoring. Comparable percentages of participants thought that the case was worth more than the low anchor in both conditions, which drove an effect on mean awards. This effect, however , is the rational product of a policy limit. The policy limit caps their liability. The median and quartile estimate thus provide only the barest hint that he higher cap influence the assessment of the underlying claim among participants who thought it was worth well below the anchor. Thus, the only effect of the policy limit observed was the effect one would expect without any psychological influence of an anchor.

3. Anchoring Discussion

It is unclear why the reinsurance executives resisted the effect of the anchor while the insurance claims adjusters were affected by anchoring. The "experience" hypothesis presented in this paper would seem to point in the opposite result. The insurance adjusters assess claims such as the one in our scenario on an almost daily basis. By contrast, the reinsurance executives would rarely, if ever, have occasion to assess a claim arising from a relatively small car accident, such as we presented. Why then, did the more experienced participants commit the error?

Several answers suggest themselves. Possibly, the role of advisor, suggested by the instructions gave the reinsurance executives a different perspective on the case that allowed them

to ignore the anchor. In other contexts, an agency role has been found to mitigate the effects of misleading cognitive perspectives. (Arlen, Talley & Spitzer, 2000). Nevertheless, we doubt that this accounted for the difference. The interests and goals of the advisor and insurer were substantially identical, and do not suggest much in the way of a different orientation.

It is possible that the failure to ask the participants to first consider settling for the policy limit also had an effect. Anchoring might be more powerful when people must actually accept or reject the anchor, than just consider it. While plausible, nothing in the existing literature on anchoring suggests this possibility. Many anchoring studies, including the original one (Tversky and Kahneman, 1973), do not include such a request. Furthermore, our participants were well aware of the policy limit. A sizeable percentage of participants in the low anchor condition settled for the policy limit, and none exceeded it. Although such an effect cannot be ruled out, it seems an unlikely candidate to explain this pattern of results.

Rather, it could be that despite our assertions above, it is truly sensible for the participants to rely on the anchor in assessing these settlements. Perhaps insurers are so accustomed to factoring in the possibility of an extreme jury award into their settlement decisions that they do it almost automatically. The reinsurance executives, lacking in the experience of settling such claims, missed the importance of the liability cap. Policy limits are surely important to reinsurers, but they would not necessarily arise in quite the same context. Our problem was directed at the kind of standard policy claim that primary insurers assess. Furthermore, even if reliance on the policy limit in this study was erroneous, the circumstance here might be unique. Amorphous damage claims, such as for pain and suffering, almost always have the potential to produce an award that exceed ths policy limit. In contrast, when the claim does not include any amorphous elements, and involves only claims for damage to property, insurers will commonly have objective measures of the extent of the claim, making the policy limit irrelevant. Thus, our tests might have inadvertently uncovered the development of a highly useful heuristic

The results of our inquiry into anchoring, however, must be taken as somewhat inclusive. It is unclear exactly what produced the differences we observed. Even the inclusive nature of this study is somewhat telling. In other populations, anchoring is not a difficult phenomenon to replicate. It does not require a careful tailoring of the numeric anchor to the actual estimates. Even absurdly high anchors have an effect and low anchors also seem to manage to push down the distribution of awards in most anchoring studies. Our failed study is hard to interpret, but the participants showed no inclination to scale their awards down to the anchor that proved to be too low. The least one can say here is that anchoring among insurers displays a complexity not found in other populations.

## III. Brief Conclusions[16]

[16] Implications and elaborations to be added.

Insurers are different. They attend to statistical cues that lay persons ignore, such as base rates, and ignore misleading cues to which lay persons attend, such as decision frame and similarity judgments. In particular, the more closely our materials tracked the kinds of decisions insurers actually make, the more their decisions tracked rational choice. They were by no means invulnerable to cognitive error, however. Their decisions were far from perfectly consistent with rational choice theory. Furthermore, the results from the anchoring study suggest that insurers develop and use heuristics so as to mimic rational choice theory. Thus, it is not so much that the insurers have simply abandoned heuristics in favor of a rational approach as it is that their style of thinking is closely attuned to the tasks they must accomplish with a minimum of error.

Perfectly rationality is, in fact, not required for insurers to perform well, so long as it is not adopted by anyone in the insurance market. The insurance firm that has the most accurate approach on risk assessment will be in a better position than its competitors. If competitors overstate risks, then the clear-eyed firm will be able to compete well on price; if the competitors understate risks, then the clear-eyed firm will be able to avoid writing policies with premiums that are insufficient to cover expected losses. It is unclear whether such competition would eventually drive insurers to adopt perfectly rational strategies, or just comparatively good strategies for assessing risk.

The situation insurance companies face is comparable to a common joke:

> Two friends go to visit a jungle , where accidently they stumble upon a tiger. One of them gets ready to run, whereupon his friend says "Don't be stupid, you can't outrun the tiger." To this the friend replies, "I don't have to outrun the tiger , I just have to outrun you!"

Obtaining a cognitive advantage over lay persons is even less troublesome. Insurers need only have a comparative advantage over those with whom they negotiate to reduce settlements and claims paid below the expected value. Similarly, when pricing insurance policies, insurers can do well if they have a comparative advantage over their customers. Repeat players, it seems, do not just have a comparative edge in the information they possess, they develop superior means of processing that information.

Furthermore, even though the materials suggest that insurance companies might themselves be vulnerable to reliance on misleading heuristics in some settings, this does not create an analogous ability for customers to take advantage of insurers. Insurers tended to perform best precisely in the situations in which it would cost them dearly to make mistakes. Consider the relatively poor performance of the reinsurance executives in assessing the liability risk of a drug company. Recall that they exhibited a fairly large framing effect. The risk in that study, however, was not really the kind of problem that reinsurance executives encounter repeatedly. The lesson might be that in unique settings that lack the actuarial information that insurers seem to be able to rely upon well, they can be mislead. Unlike insurers, ordinary customers are not really repeat players who can tailor their dealings with insurance companies so as to take advantage of the vulnerabilities of their

counterparts. So long as insurers can avoid repeatedly encountering these unusual contexts, they will retain the advantage.

The results of this study bear further replication and assessments in real world settings before policy prescriptions can be confidently endorsed. Nevertheless, these results cast suspicion upon disclosure as a means of leveling the playing field between experienced and inexperienced actors.